EXHIBIT A

Honeywell CONFIDENTIAL
ATTORNEY-CLIENT PRIVILEGED

Invention Record (Docket) No.: **H0006422**

Origin Date:

SBE: **1170 - Phnx, AZ - CP/CAPU/MHMI (E&S)**

Attorney(s): **Desmond, Robert -**

File Location: **PH - Phoenix, AZ**

Title: **Compositions and Process for Bismaleimide Foam**

Inventor: **Stevenson, James F**
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Citizenship: **USA**

SSN: **********
County: **Morris**
Supervisor: **Chien-Wei Li**

ADD INVENTOR Jeff Mendoza

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1. Briefly describe the technical or commercial problem or need that this invention is intended to solve.
A previous disclosure describes a high pressure batch process with rapid pressure release for making a foam for noise suppression treatment. With this process, production of large panels, e.g. 12 inch x 12 inch, at pressures up to 2000 psi requires an expensive and heavily reinforced tool and a rugged release mechanism. Because of the need for continuous exposure to high pressure in this process, there was no access to the compound during precure for the purposes of mixing reinforcement or blowing agent, removing unwanted air, or placing a film over the reacting mixture to prevent surface hardening. Because of the rapid pressure drop in this process, the partially cured material is prone to erupt from openings needed for pressure release or form large voids in regions away from the gas escape location. The low pressure process described in 2 resolves these issues.

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2. Briefly describe how this invention solves the problem or meets the need.
This invention is a low (ambient) pressure process for making open cell bismaleimide (BMI) foam using a chemcial blowing agent, a powder which decomposes at a specific elevated temperature to give off a gas. The tooling is a light thinwall (0.5-inch) aluminum mold wich must seal against a vacuum of about 28 inches of Hg. The BMI melt, which has a relatively low viscosity prior to cure, is available for mixing in reinforcement and blowing agent, removing trapped air and placing of film to prevent surface hardening. Becasue foam formation is very slow during heating of the partially cured material, the foam does not splatter or erupt from the mold and void formation is minimized. Tooling and operating procedures are much simpler, safer, and more reliable for atmospheric pressure operation.

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3. Describe how to make and use the invention. Please indicate which embodiment(s) are preferred and describe the best way known to you to practice the invention. Attach relevant documents. (If the invention is a device or process, please provide a drawing or flow chart.) (If you are unfamiliar with the contents and preparation of a patent application, please refer to the Guidelines for the Preparation of Invention Disclosures.
See attached document
Document(s):
✓ H0006422_MU1_Low Pressure Process for BMI Foam1.doc

4(a). To the best of your recollection what is the earliest date on which the invention was conceived? Who conceived the invention? Attach documents which evidence the foregoing.

Conception Date: Who conceived it?: **James Stevenson**
Document(s):
✓ H0006422_CD1_Worksheet

4(b). Is there a non-inventor who witnessed the conception? If so, please identify him/her and attach any documents which evidence the witnessing.

Yes
Witness Name: **Karl J. Smith** Witness Phone: **973 455 2169** First Practice Documents:

5(a). To the best of your recollection, what is the earliest date on which the invention was reduced to practice (i.e. made)? Who reduced the invention to practice. Attach documents which evidence the foregoing. If no reduction to practice, type "n/a".
First Practice Documents:
First Practice Date: Who reduced it to practice?: **James Stevenson**

5(b). Is there a non-inventor who corroborated the reduction to practice? If so, please identify him/her, the corroborating activity (i.e., over-the-shoulder corroboration or repeating the experiment), and the date of the activity. Attach documents which evidence the foregoing.

Non-inventor corroborator?:
Yes

First Corroborator Name:
Karl J. Smith

First Corroborator Phone:
973 455 2169

First Practice Corroboration Date:

First Practice Corroborator Activity:
Observed product on removal from mold.

✓ Document(s) related to corroboration event:
H0006422_FPCD_Runsheet and Photo

5(c). For each example of the invention and each comparative example on which you intend to rely in the patent application, please indicate when the example was generated, who conducted the experiment and where this example is recorded (e.g., volume, page and author or laboratory notebook) and attach a copy of these records. If no example available, type "n/a".
Example(s):
H0006422_Ex1_Notebook 40073 p.1.tif
Example Date
Who conducted the experiment?: **James Stevenson**
Where is example recorded?: **Notebook 40073 page 1**

6(a). Did this invention arise in a program that is funded in whole or part by the U.S. Government or another company, or any entity other than Honeywell?
No

6(b). If so, please identify the program (including government contract number, if applicable) and the entity sponsoring the program and provide a copy of any agreement between the parties concerning the program.

Outside Funding Program:
Contract Number *(if applicable)*:
Outside Funding Entity:
Document(s) related to funding agreement:

7(a). To your knowledge, is this invention subject to any agreement between Honeywell and a third party (e.g., a secrecy agreement, license agreement, joint development agreement, etc.)?

7(b). If so, please identify the agreement and the other party and attach a copy of the agreement if one is available.
Third party agreement ID:
Third party name:

8. You have a duty to disclose to the U.S. Patent and Trademark Office all relevant prior art of which you are aware. Please list all such prior art (e.g., patents, publications, brochures, Honeywell and third-party products) known to you. If a prior art search has been conducted, it must be included. Briefly indicate how this invention is different from the prior art. See 1 and 2 above.
List of prior art:
Three patents which cite "BMI" and "foam" made by other processes are the following: US 5,380,768; US 4,193,829; US 4,135,019. US 6,401,414 teaches details of foam formation using phenolic resins.
How invention is different from the prior art:
Prior art patents '829 and '019 form foam with glass microspheres which are added to the BMI resin. Microspheres are closed cells and not useful for noise reduction. Patent '768 discloses use of a BMI film with a polyurethane foam. Patent '414 may limit claims made for an alternative material, phenolic, made for the appllication.

9(a). Has the product or process which is the subject of this invention disclosure been disclosed, sold or offered for sale to anyone outside of Honeywell or to the general public.

9(b). If so, when and to whom was it disclosed, sold or offered for sale? If it was disclosed, was a secrecy agreement in place? Attach documents which evidence the sale or offer for sale.

Date it was disclosed:
Whom disclosed to:
Disclosure Sales Agreement?
Document(s) which evidence the sale or offer for sale:

9(c). Does the business intend to disclose, sell or offer to sell the invention to anyone outside of Honeywell or to the general public in the near future? If so, to whom and when is this disclosure, sale or offer for sale planned?

For whom are future sales planned:
Date future sale is planned:

10(a). Does this invention relate to any other: (i) issued patents, (ii) pending patent applications, or (iii) previously submitted invention disclosures, of Honeywell?

10(b). If so, please identify the related matter and indicate whether this is an improvement on an earlier invention: Other patents related matter is:

Is this an improvement?:

11. Please specify the product(s) to which this invention disclosure relates.
Noise reduction treatments for Auxiliary Power Units, Environmental Control Units, Propulsion and Turbochargers. This invention has potential applications for noise reduction in high temperature environments. It should be considered as a replacement anywhere honeycomb is currently used for noise reduction.

12. Please indicate keywords for identifying this invention disclosure.
foam, noise suppression, bulk absorber, bismaleimide, high temperature, thermoset

Witness Name: ____________________

Witness Signature: ____________________

Date: ____________________

Inventor Name: ____________________

Inventor Signature: ____________________

Date: ____________________

Inventor Name: ____________________

Inventor Signature: ____________________

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Date: ____________________

Inventor Name: ____________________

Inventor Signature: ____________________

Date: ____________________

Send to:
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Phoenix, AZ 85034
The attorney assigned to this disclosure.

Low Pressure Process and Compound for Bismaleimide Foam

Compound

The materials and amounts used in making BMI foam are as follows:

1. Polymer: Bismaleimide (BMI) Cytec Cycom® 5250-4 RTM
2. Blowing Agent: SAFOAM RPC Reedy International, 3-10% of polymer weight with 5% preferred
3. Reinforcement: (a) Kevlar pulp DuPont IF538 MERGE 0.25 to 3% of polymer weight with 0.5% preferred
   (b) Powdered carbon fiber Amoco Thornel T-300 3K 0. 5 to 3% of polymer weight with 1% preferred

The carbon fiber is converted to a powder (micron scale fibers) in a small ball mill.

Other combinations of materials are possible, such as phenolic resin with water (a product of the polymerization reaction) as a blowing agent.

Another commonly used additive, fumed silica, was investigated and found to be detrimental to impact properties.

Process

The process for making 12-inch square BMI foam panels involves the following steps:

1. The compound ingredients are weighted out. Exposure of BMI to moisture in air in minimized. Optionally, the Kevlar pulp may "fluffed up" in a blender to facilitate mixing.
2. An aluminum mold was fabricated with interior dimensions of 15 x 15 x 3 inches (Fig. 1). The junctions between plates in the mold were sealed with gaskets or O-rings. Frekote 700NC mold release is applied to all contact surfaces to insure intact removal of the cured part.
3. The mold is preheated to 150°C on a press. BMI granules are placed in the mold, which is returned to the press, and allowed to melt for about 30 minutes. *Alternatively, the material can be heated with microwaves.*
4. The mold is removed from the press and tilted to accumulate the melted BMI along one edge. First the blowing agent and then the reinforcement is mixed using a driven turbine stirrer. e.g. a paint stirrer on a drill. Considerable mixing is required for Kevlar pulp; the increased viscosity as the melt cools is of some benefit in mixing in the pulp. The carbon fiber is easier to mix but tends to settle so initial mixing when the cure is more advanced or a second later mixing may be necessary.
5. The mold is closed and returned to the press where it is reheated to 150°C for about 20 minutes. To remove air introduced during mixing, a vacuum of about 25-27 inches of Hg is pulled on mold for about 2 minutes with return to ambient pressure for about 1 minute. This vacuum process is repeated 3 or 4 times. A BMI lattice pattern on the inside top surface of the mold indicates the foam bubbles up to the interior top surface of the mold as a result of the vacuum.

6. After precure of the compound for a total of 150 minutes at 150°C, the temperature of the press is raised to 210°C over a 25 minutes and then reset to 200°C. Blowing agent decomposition and BMI cure take place during this time interval; the time-temperature profiles used here have been developed to give the proper balance between gas formation and viscosity increase which allows the gas to be trapped. The foam generally consists of large (0.5-3 mm), mostly open, cells (Fig. 2).
7. After cooling, the foam slab is removed from the mold. The slab is bonded to a backing board and machined using end mills to obtain flat surfaces and a table saw to cut the edges to size. The surface of the foam may be sandblasted to facilitate opening of surface cells.

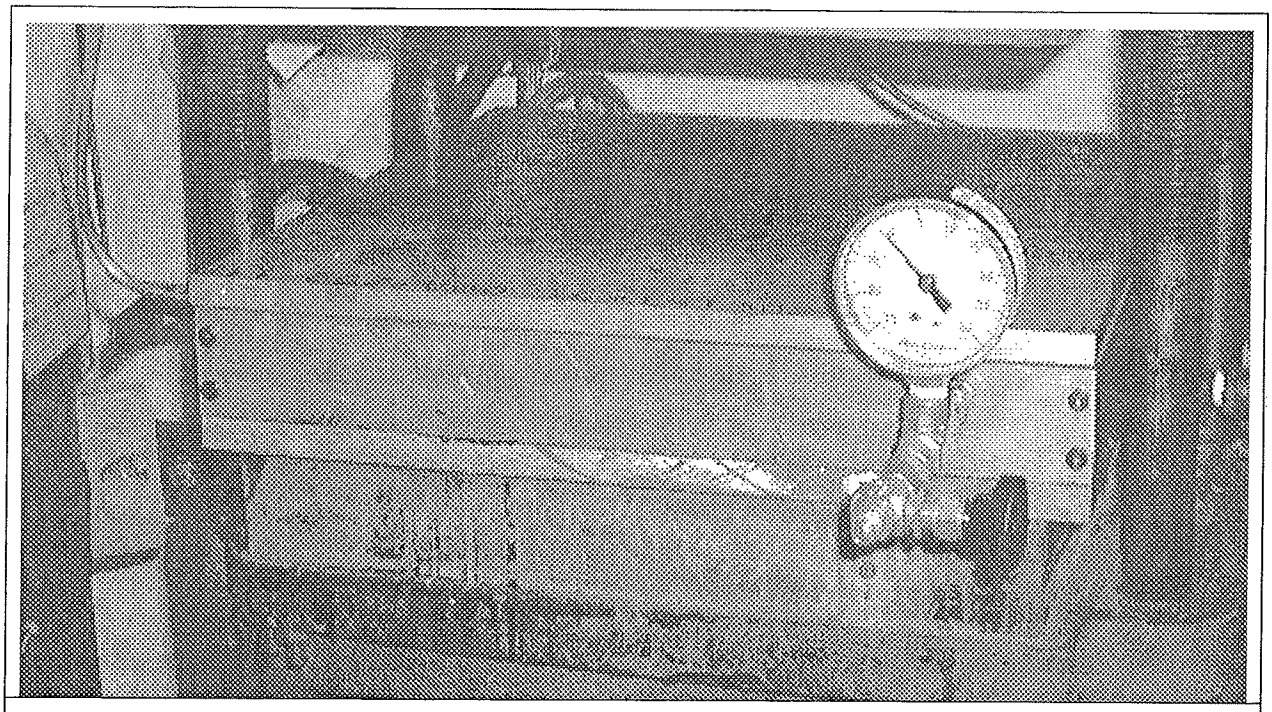
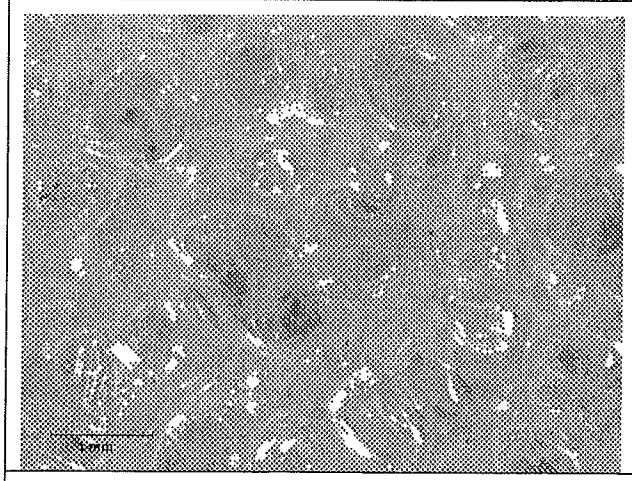
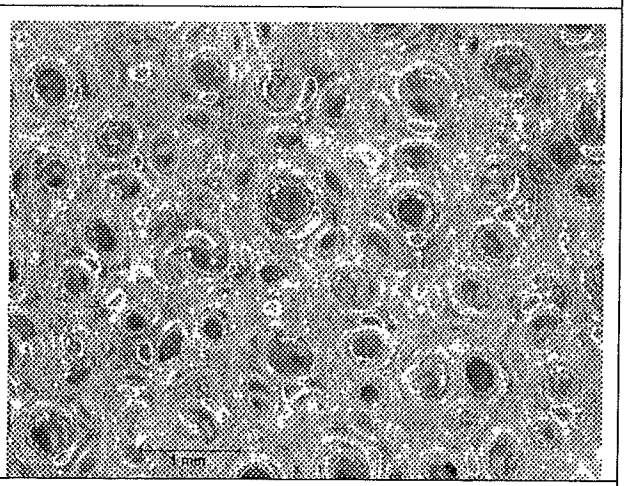


Fig. 1. Full size 16 x 16-inch mold with vacuum.



(a) Kevlar pulp reinforced foam.



(b) Carbon fiber powder reinforced foam.

Fig. 2.

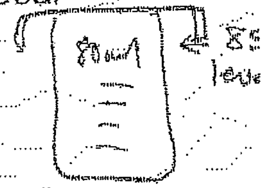
Foam High Pressure Cell Datasheet

Date ___

Composition		Amount
Material	BMI (PBI 105 min ✓)	50 g
Gas	Ready RPC 5%	2.5 g
Nucleating Agent]		
Reinforcement	Kevlar 1%	0.5 g
Other		

Cell Configuration — No mold release

- [ ] Toggle
- [ ] Hydraulic
- [ ] ___ Viton Upper Seal
- [ ] New Parker Lower Seal
- [ ] Frekote 00
- [ ] Perf Plate
- [ ] BMI Base Plate



Prupose Make specimen with chemical BA at atmospheric pressure

Configuration Notes Glass beaker on Carver press

B Stage	
Time	Temp

Cure 120 @ 165 / 60 min 220 °C Chronology B Stage 105 @ 150

Time	Action	Press (psi)	Temp (C)	Displace (in)	Comment
12:54	Seal	0	165		
	Temp Set				
2:54			200		

density = ___

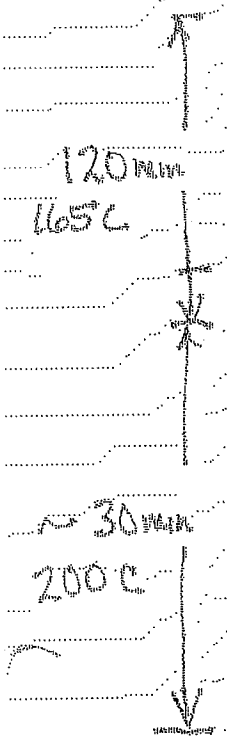
Specimen Notes Specimen rose in beaker with increasing temp/time. Dark yellow skin on top which angled down away from observed

Recommendations [illegible] of beaker. BMI stuck to beaker so beaker broken and peeled away. Specimen to be cut at angle. Large pores but no voids.

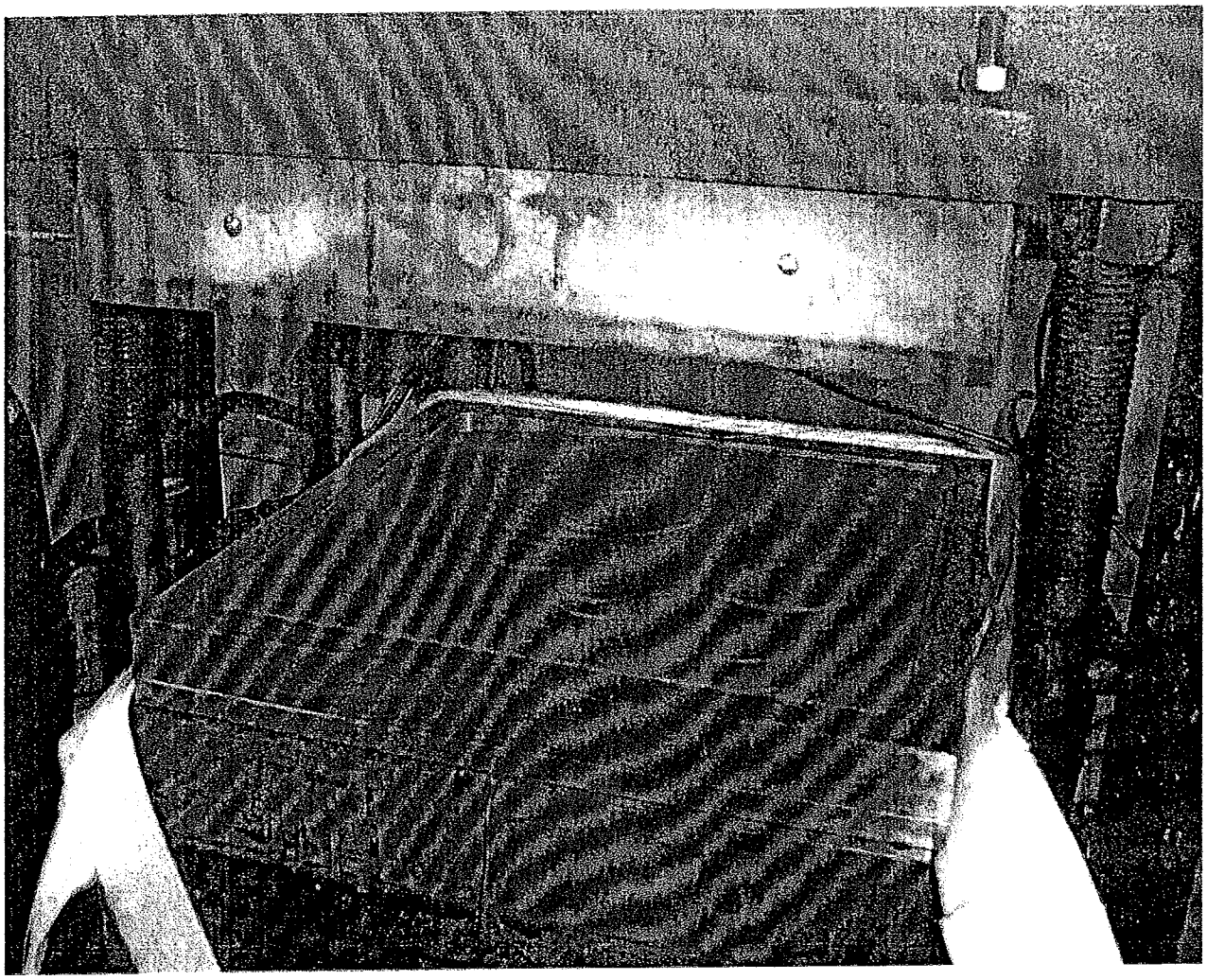
Specimen Ratings (Higher scaled ratings are better)				
Breakage (0-1)		Cell Size (mm)	max	
Voids (0-1)		Plate Attachment (%)		
Stiffness (0-3)		Perforate Attachment (%)		

Recommendations: trial w/ new [illegible] piston [illegible]

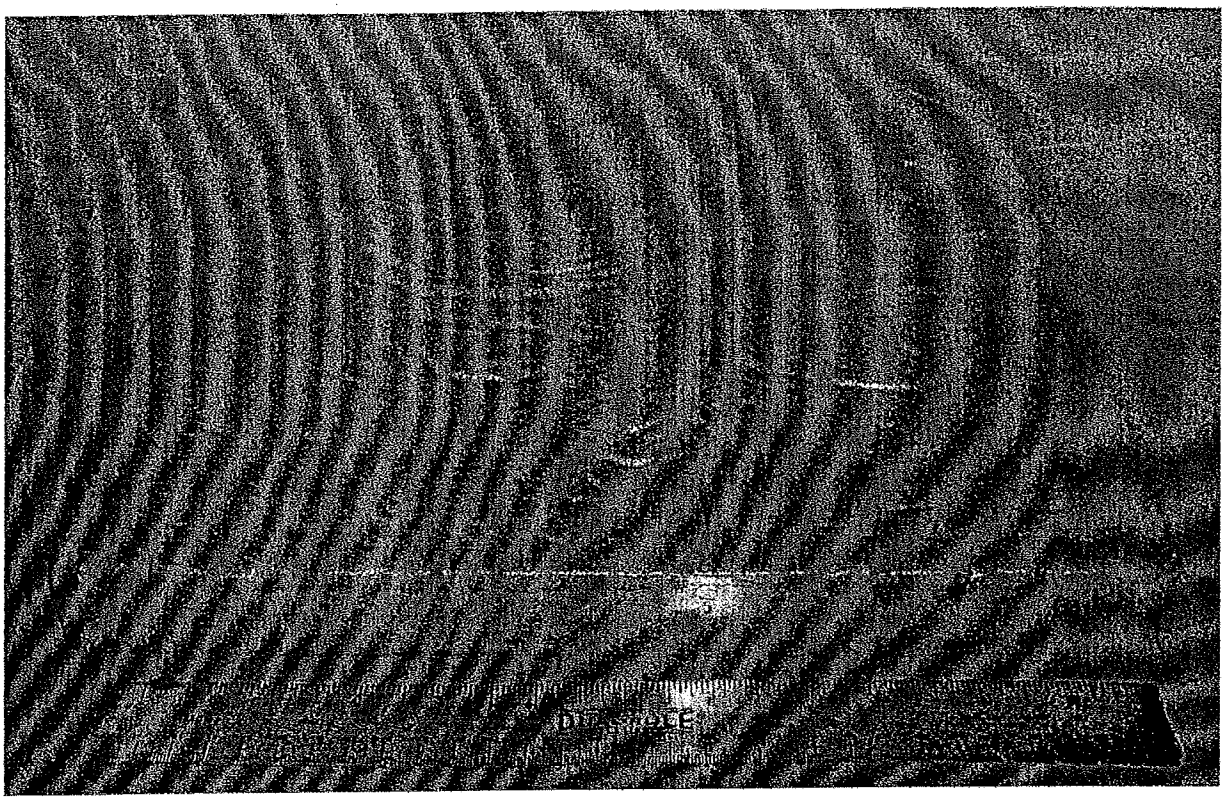
Date ____ _____



Time	Temp	Comment
12:54	150	Set Point 165
12:54	150	Specimen between plates
1:04	172	One third melted
1:14	165	Kevlar not uniformly dispersed
1:46	165	Kevlar mixing better low viscosity
2:55	165	Set Point 200
		Specimen raised. Foam width
		large bubbles visible from side
		Leaflike skin on top
		Unformed dark layer on bottom
2:58	185	Foam at 80 mm level
3:02	207	5mm foam on bottom layer
3:04	210	Foam on bottom layer 85 mm level
3:22	198	Bottom formed. Foam at 95 mm level
4:20	200	Set Point ~ 20°C



Full Size Foam Panel
in Mold



Top[Surface of Foam Panel
13x13x1.25 inch

Reinforcement:
0.5% Kevlar pulp
Density: 0.19 g/cc